

What I claim is:

1. A machine for treating the surfaces of food products comprising:

a) a support frame;

5 b) a cylindrical product carrier shell mounted in said frame and having a plurality of openings formed therethrough;

c) a waste collecting bell coaxially circumscribing said carrier shell and sized to provide a waste collecting space therebetween, said collecting bell being mounted for rotation in

10 said frame and connected to said carrier shell;

d) a product cleaning drum mounted in said frame for rotation about a generally horizontal axis, said product cleaning drum having opposed product input and outlet ends and being coaxially mounted within said carrier shell and sized to provide

15 an annular product cleaning space therebetween;

f) abrading means mounted on said cleaning drum for rotation therewith and having extending abrading members for applying surface pressure on products when they are in the cleaning space between said cleaning drum and said carrier shell;

20 g) a first drive means coupled to rotate said cleaning drum and a second drive means coupled to rotate said carrier shell and said collecting bell, said first and second drive means being independently operable at speeds wherein centrifugal force urges products when they are in the cleaning space between said

25 cleaning drum and said carrier shell into bearing engagement with

the inner surface of said carrier shell and expels waste materials through the openings formed in said carrier shell into the waste collecting space between said carrier shell and said collecting bell;

5 h) product feed means for supplying products to the cleaning space between said cleaning drum and said carrier shell;

i) product discharge means for receiving treated products from the cleaning space between said cleaning drum and said carrier shell; and

10 j) waste material disposal means for receiving waste material from the waste collecting space between said carrier shell and said collecting bell.

2. A machine as claimed in claim 1, wherein the openings formed in said product carrier shell range in size from about one half 15 inch to about two and one half inches.

3. A machine as claimed in claim 2, wherein said product carrier shell further comprises a liner of resiliently deformable frictional material on the inner surface of said carrier shell to completely cover the inner surface and underlay the openings formed therein, said liner having a plurality of openings formed in the areas thereof which underlay the openings formed in said carrier shell.

4. A machine as claimed in claim 1 wherein said waste collecting bell has an open end proximate said waste disposal means and is of frusto-conical configuration to provide a surface which diverges from proximate said product feed means to proximate the 5 open end thereof so that waste material entering the waste collecting space under the influence of centrifugal force will impinge and slide along the diverging surface toward said waste disposal means.

10 5. A machine as claimed in claim 1, wherein said abrading means comprises:

a) a plurality of arcuate plate segments proximate the periphery of said cleaning drum; and
b) a plurality of radially extending control assemblies mounted in said cleaning drum with each of said control 15 assemblies being connected to a different one of said plurality of arcuate plate segments, said arcuate plate segments responding to centrifugal force by moving radially from proximate the periphery of said cleaning drum under control of said control assemblies.

20 6. A machine as claimed in claim 5, wherein said plurality of arcuate plate segments are four in number.

7. A machine as claimed in claim 5, wherein the abrading members of said abrading means are in the form of an array of tufts disposed to substantially cover of each of said plurality of arcuate plate segments, with each of said tufts including a 5 plurality of whips.

8. A machine as claimed in claim 1, and further comprising;
a) a drive shaft mounted in said frame and coupled to said first drive means for being rotatably driven thereby, said drive shaft defining the generally horizontal axis about which said 10 cleaning drum is rotatable; and

b) said cleaning drum including,

i) at least a pair of wheel structures each having a hub mounted on said drive shaft,
ii) a plurality of spokes extending radially from the hub of each of said wheel structures,
15 iii) a circular rim attached to the extending end of each of said spokes, and
iv) a cylindrical body mounted on the rim of each of said wheel structure.

20 9. A machine as claimed in claim 8, and further comprising an eccentric device in the hub of at least one of the wheel structures of said cleaning drum for adjustably positioning said cleaning drum eccentrically on said drive shaft.

10. A machine as claimed in claim 8, wherein said abrading means comprises:

a) a plurality of arcuate plate segments in circumscribing positions about the periphery of said cleaning drum; and

5 b) a plurality of control assemblies mounted on each of said wheel structures, each of said control assemblies extending radially from its respective one of said wheel structures and being connected to a different one of said plurality of arcuate plate segments, each of said arcuate plate segments responding to 10 centrifugal force by moving radially from the periphery of said cleaning drum under control of said control assemblies.

11. A machine as claimed in claim 10, wherein each of said plurality of control assemblies comprises:

15 a) a diagonal bar extending between adjacent ones of said plurality of spokes, said diagonal bar having a transverse pin intermediate its opposite ends;

20 b) a rod attached to said diagonal bar and extending radially through said circular rim and said cylindrical body of said wheel structure, said rod having its distal end connected to said arcuate plate segment and having a slot formed in its proximal end which engages the pin of said diagonal bar to allow radial movement of said rod and said arcuate plate segment under the influence of centrifugal force; and

c) a pair of links extending tangentially from said rim to opposite sides of said arcuate plate segment to prevent deviations in the radial movement path of said arcuate plate segment.

5 12. A machine as claimed in claim 11, and further comprising:

a) a shoulder on said rod; and
b) a compression spring extending between said shoulder and said rim of said wheel structure to bias said arcuate plate segment toward the periphery of said cleaning drum.

10 13. A machine as claimed in claim 11, wherein one end of said diagonal rod is selectively positionable on one of said adjacent pair of spokes to move the transverse pin radially to change the radial movement path of said rod and said arcuate plate segment.

15 14. A machine as claimed in claim 1, wherein both said first and said second drive means are variable speed and reversible drive mechanisms to allow independent variations in the rotational speeds of said cleaning drum and said interconnected carrier shell and waste collector bell and to allow co-rotational and counter rotational driving thereof.

20 15. A machine as claimed in claim 1, wherein said product feed means comprises:

a) a product feed chute mounted in said frame;
b) a frusto-conical nose cone formed on the product input
end of said cleaning drum; and
c) a frusto-conical nose cone formed on said carrier shell
5 and circumferentially spaced about said nose cone of said
cleaning drum to provide a transition space through which the
products to be treated are moved from said product feed chute
into the cleaning space between said product cleaning drum and
said carrier chute.

10 16. A machine as claimed in claim 15, and further comprising:
a) said nose cone of said carrier shell having a plurality
of openings formed therein; and
d) abrading whips extending from said nose cone of said
cleaning drum into the transition space between said nose cones
15 of said cleaning drum and said carrier shell to dislodge dirt and
other debris from the products being moved therethrough, the
dislodged dirt and other debris exiting the transition space
through the openings formed in said nose cone of said carrier
shell under the influence of centrifugal force.

20 17. A machine as claimed in claim 16, wherein said nose cone of
said carrier shell is formed with a frictional surface that faces
into the transition area with the products to be treated being

urged into bearing engagement therewith under the influence of centrifugal force.

18. A machine as claimed in claim 16, wherein said abrading whips on said nose cone of said cleaning drum gradually increase in 5 length and stiffness between the small and the large ends of said nose cone to gradually introduce the products to be treated to abrading surface pressure.

19. A machine as claimed in claim 1, wherein said product discharge means comprises a product collection cowling at the 10 product outlet end of said cleaning drum for receiving products that have been treated, said cowling enclosing the end of the cleaning space between said cleaning drum and said carrier shell and having a product delivery chute through which products exit the machine.

15 20. A machine as claimed in claim 1 wherein said product discharge means comprises:

a) a product collection cowling at the product outlet end of said cleaning drum for receiving products that have been treated, said cowling enclosing the end of the cleaning space between said 20 cleaning drum and said carrier shell;

b) a product delivery chute at the bottom of said product collection cowling; and

c) an idler wheel mounted for free wheeling rotation within said product collection cowling for receiving products on its peripheral surface and easing them downwardly toward said product delivery chute.

5 21. A machine as claimed in claim 1, wherein:

a) said waste collecting bell is of frusto-conical configuration to provide an inner surface that diverges toward its larger open end so that waste material entering the waste collecting space will impinge and slide along the inner surface 10 toward the open end of said collecting bell; and

b) said waste disposal means includes a waste discharge trough proximate the open end of said collecting bell to catch waste materials that fall from the open end thereof.

22. A machine as claimed in claim 21, wherein said waste disposal 15 means further comprises

a) a scraper at the open end of said collecting bell for removing waste materials that are stuck to the inner surface thereof; and

b) a waste scraper trough mounted to receive the waste 20 materials removed by said scraper and to carry them out of the machine.

23. A machine as claimed in claim 1, wherein:

- a) said waste collecting bell is of frusto-conical configuration and having its larger end open;
- b) a dust collector cowling proximate the large open end of said waste collecting bell and configured to enclose the adjacent end of the waste collecting space; and
- 5 c) a pipe extending from said dust collector cowling for connection to a source of negative pressure to provide a partial vacuum within said dust collector cowling.

24. A machine as claimed in claim 1, wherein:

- 10 a) said collecting bell is formed of two interconnected pieces that provide an annular opening intermediate the opposite ends of said collecting bell;
- b) a dust collector cowling is circumferentially mounted on said collecting bell and disposed to enclose the annular opening formed therein; and
- 15 c) a pipe extends from said dust collector cowling for connection to a source of negative pressure to provide a partial vacuum within said dust collector cowling.

25. A machine as claimed in claim 1, wherein said frame is supported on adjustable legs for changing the angle of the axis of rotation of said cleaning drum and said interconnected carrier shell and collecting bell.